Malaycious: Usable Mobile Food Finding Application

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ABSTRACT

Food-finding application is an application that provides users with classified and suggestive information about the local food one particular country. Apparently, there are numbers of the food-finding applications in the Malaysia's apps market such as Malaysia Food diary, Hungrygowhere, FoodSpotting etc. However, lacks of classified and suggestive information are the main limitations of the current applications. In order to overcome the limitations of the existing applications, features such as augmented reality, photographic food diary, and smart budget are implemented in the proposed solution. A survey is conducted to understand end-users insights on their usage of food finding application in Malaysia. Based on the gathered evidence, Malaycious is introduced as a new food finding application that bridges the gap of known challenges. Augmented reality (AR) is implemented in the proposed system to enrich users camera feed with contextual information. Users can now benefits from the ability to the place computer generated graphics in the field of vision. Besides that, shooting food becomes one of the fastest growing hobbies for people nowadays. Therefore, the proposed application will include a new feature called Photographic Food Diary to store that pictures that users capture. Therefore, users can recall back the images and also the information of the images. In addition, Smart Budget is a feature that help users to filter the food according to the preferences that user entered. The detail discussion were provided in the relation to the development of Malaycious. Therefore, it can be suggested that Malaycious provide usable and user-friendly food-finding application.

Keywords: Augmented Reality, Intelligent System, Usability, Mobile Application, Food-finding.

I INTRODUCTION

Malaysia is a multi-ethnic and multi-religious country. It includes Malay, Chinese, Indian and other ethnicity. People also connect to their cultural or ethnic group through similar food patterns. Food represents the cultural identity. The ingredients, methods of preparation and preservation techniques at different meals are varied among cultures. In addition, food can be associated with hospitality and expression of friendship. Therefore, sensitivity to food rules and customs is important to build and to strengthen the cross-cultural relationships. Having multiracial people with various ethics and cultures promote Malaysia's food to another level especially from the international perspective.

Statistical evidences from The Tourism Malaysia stated that there is a continuous growth in total number of tourist in Malaysia from the year 1998 to 2014. In addition RM51.1 billion was contributed to Malaysia's Gross National Income (GNI) in the year 2013 from the tourism industry. From January to May, Malaysia welcomed a total of 11.53 million (11,532,859) tourists, registering a hike of 10.1% compared to 10.48 million (10,478,419) tourists for the same period last year (Tourism in Malaysia, 2015). This indicates that tourism plays an important role for Malaysia development. This industry effects positively on the economy of Malaysia. Based on the Tourism Malaysia official website, their objective is to promote Malaysia as an outstanding tourist destination (Tourism Malaysia Official Website, 2010). Besides that, a report by CNN Travel shows that Malaysia is one of the Top 10 countries that have the most delicious food in the world. Penang assam laksa places 7 out of 50 foods around the world (CNN Travel, 2015).

Therefore, in this paper is mainly to research on food-finding application that currently in the market, identify the features of the applications and hence develop solution and implement a food-finding application that contain features to solve the problem face by users. This paper organize as follows, related works will provide useful literature about the problems and comparison of the existing system, preliminary study highlights the survey results, the proposed solution introduces the *Malaycious* as means of solution which explain the modules involve and discussion about the overall analysis and finally ending with the conclusion and future work.

II RELATED WORK

Nowadays, people can easily access or search the information they want with the introduction of WiFi or mobile Internet. They can easily get their

information with just few clicks. Compare to the olden days, now travelling is no longer a difficult task. People no longer worried about lost in a country. With the use of the GPS navigation application, users can easily retrieve the route information, view the location on the map or even explore around the area destination through 360-degree, panoramic and street-level imagery.

Based on the investigation, none of the existing food –finding application in the market provides one-fits-all solutions in a single application. In fact, the features are being separately implemented in different applications. In order to obtain all the information, users are required to download different applications which also need extra memory space and additional cost to store it. For example, "Street Food" (Google Play store, 2015) is an application that integrated with Malaysia's local food recommendation feature, which is not implemented in any other food-finding application that is available in today's market. However, "Street Food" application contains its own limitation. It does not provide users with the location of dine-in places where the users are able to find the local foods mentioned in the application. Thus, users have to use a separated GPS navigation system or virtual map application in order to obtain the location information of the dine-in places where they are able find the foods recommended.

Today, people enjoy showing to the world what they eat by photographing every meal, revealing themselves perhaps more vividly than they might by merely reciting the names of appetizers and entrees (i.e. foods and drinks). There are many existing application allows user to take and store their pictures. However, this function normally is not embedded with the food-finding application. Thus, users have to download another application to capture and to store their images.

Food-finding applications can be viewed from two main perspective which are local market (i.e. Malaysia context) and international markets. However, most of those applications do not equip with all the features as shown in Table 1 and Table 2 (Google Play Store, 2015). The "√" in the tables indicate that the applications contain certain features and the "-" indicate the applications do not contain certain features.

Table 5. Existing food finding application in the local market (Google Play Store, 2015).

Application / Feature	Food Spotting	Hungry gowhere	Four square	Kuala Lumpur Travel Guide and Offline City Map	Malaysia Food Diary	Malay cious
Location on map	√	√	√	√	√	√
Locations Nearby	√	√	√	√	√	√
Local food description	√	√	√	-	√	√
Smart Budget	-	-	-	-	-	√
GPS navigation	√	-	√	-	√	√
Photographic Food Diary	-	-	-	-	-	√
Augmented Reality	-	-	-	-	-	√
Top 10 Must Try Food	-	√	-	-	-	√
Translator	-	-	-	-	-	√
Malaysia's Map	√	√	√	√	√	√

Table 1 shows a comparison of food-finding applications. *Foodspotting* is an application that discover nearby dishes and restaurants. *Food spotting* also contains several features such as GPS navigation, nearby locations, Malaysia's map and so on. However, it does not have the Smart budget feature. This feature is to filter foods according to the price that user has entered. It also does not contain Photographic Food Diary features that allow users to store their food images. *Hungry Go Where* is another application that contains more or least the same features as Food spotting. This application consists of the Top 10 dishes must try features. On the other hand, *Kuala Lumpur Travel Guide and Offline City Map* is an application that contains offline map. However, it does not help users to find nearby restaurant and do not have the smart budget feature. Besides that, *Malaysia Food Diary* is an application that developed by the former student of Universiti Sains Malaysia. In this application, it contains some of the functions compared to *Malaycious.* However, it does not contain the features such as Smart Budget, Photographic Food Diary, Augmented Reality and Top 10 Must Try foods.

Table 6. The existing food finding application in the international market (Google play Store, 2015)

Applications / Features	Zomato	Food Network On The Road	Find Dining: Restaurant Finder	Street Lens
Location on map	✓	✓	✓	✓
Locations Nearby	✓	✓	✓	✓
Local food description	✓	✓	✓	-
Smart Budget	-	-	-	-
GPS navigation	✓	✓	✓	✓
Photographic Food Diary	-	-	-	-
Augmented Reality	-	-	-	✓
Top 10 Must Try Food	-	-	-	-
Translator	-	-	-	-
Malaysia's map	-	-	-	-

Four applications have been chosen from the international market based on its popularity usage and rating. In Table 2, *Zomato* is an existing application that discovers the best restaurant in the world. It also can use the map feature to explore every restaurant in the city, including the ones around current locations or filters and find the one that suits you the best. Besides that, it also does not contain the features like Photographic Food Diary. *Food on the Road and Food Dining: Restaurant Finder* has the same features. The features of this application are more or less similar to *Zomato.* However, it can direct user to the place with GPS navigation but *Zomato* does not provide this function. *Street Lens* is another application that already existed in the market. *Street Lens* provides special features where others applications do not, which is the augmented reality function. However, Street Lens is not a fully food-finding application.

From the tables above, it can be noted that the existing applications in the local and international markets contain the main features like location on map, locations nearby and local food description. Besides that, it is clearly show that the existing application in the international market also consist of GPS navigation features which cannot be found in the local market. However, the existing applications in both markets do not equip with some of the main features such as smart budget, photographic food diary and augmented reality. It also can be noted that none of the applications contain the augmented reality feature and photographic food diary. These are the features that can provide more useful information to users. For augmented reality, it is a new technology that should be implementing in the application. In addition, photographic food diary allows the users to capture and store the moments in the applications. Smart budget features also not implemented in the existing applications of local and international market.

There are significant gaps exists in the food-finding application.Therefore, it open a room of improvement to develop a better food-finding application. This paper introduced *Malaycious* as a new food-findng application (i.e. highligted in Table 1). *Malaycious* is an application that help users escpecially tourists in Malaysia by providing the classified and suggestive information to the users. *Malaycious* provide functionality such as Augmented Reality, Photographic Food Diary , Smart Budget, Top 10 local food and food festival promotional.

According to Julie Carmingniani et al. (2011), Sir Ivan Sutherland creates the first augmented reality system; the optical see-through head-mounted display is used, tracked by 6DOF trackers in 1968. In 1990, Prof. Tom Caudell coined the term "Augmented Reality", and developed system to assemble cables into aircraft to help technicians at Boeing. In 1994, Steve Mann wearing a webcam which combine the mobile camera and connected to his website, allowing online visitors to comment on what he saw in daily lifes. Then in 1999, Hirokazu Kato of the Nara Institute of Science and Technology and Mark Billinghurst present the ARToolKit utilising the pose tracking library with six degree of freedom. It was then published to the open source community to be used.

III PRELIMINARY STUDY

The survey method aimed to judge the subjective feelings of people with respect to specific studies (Fowler 1993). It may be noted that questionnaire using the Internet was cheap, quicker feedback and less missing data (Nowack 1997).

This online survey is designed for adult participants, target participants must be aged 18 years old and older with the closed-ended question and multiple choices of the answer. The survey is promoted in social media such as Facebook, word of mouth and through email. The survey is also posted in the USM Info Sharing Group in Facebook. The results of the survey is showed in Table 1.

Table 3. Demographic Result

Questions	Frequency (N = 144)	Percentage (%)
Age Range		
18 – 25	103	70.5
26 – 33	27	19.9
34 – 41	8	5.5
42 - 49	4	2.7
> 50	2	1.4

Do you think Malaysia's food should be introduced to the world?		
Yes	133	93
No	6	4.2
Not Sure	4	2.8
Do you think it is easy to find Malaysia related food finding application in the market?		
Yes	44	30.8
No	62	43.4
Not Sure	37	25.9
How do you feel with about the tourism industry in Malaysia?		
Excellent	7	4.9
Good	62	43.4
Satisfactory	53	37.1
Weak	15	10.5
Really Weak	6	4.2
Most preferable place to travel		
Europe	42	28.8
ASEAN (i.e. Indonesia, Thailand, etc.)	11	7.5
East Asian (i.e. Japan , Korea, Taiwan)	69	47.3
Malaysia	24	16.4
Most preferable way to travel		
Buy Package Tour	18	12.5
Hire local tour guide	32	22.2
Self- guided tour	94	65.3
Activities during travel		
Visit all the famous places	93	64.1
Looking for local famous foods	100	69
Shopping	43	29.7
Sight-Seeing	71	49
Make new friends	8	5.5
What brand of smartphone you use?		
Apple	37	25.7
Microsoft	3	2.1
Lenovo	11	7.6
Samsung	61	42.4
Sony	11	7.6
Blackberry	2	1.4
Vivo	1	0.7
Others	18	12.5
Do you use the food-finding application during travel?		
Yes	62	42.5
No	84	57.5
If yes, what are the disadvantages of the current food-finding application?		
Lack of information	38	62.3
Not user-friendly interface.	31	50.8
Not much unique function.	21	34.4
No recommendation. (i.e. food, places)	8	13.1
Too simple.	4	6.6
Others: Always wrong information; Some are heavily influenced by the sponsors.	3	4.9

What are the features do you wish to be embedded in the current food-finding application?		
More useful information.	49	80.3
User friendly function.	32	52.5
Unique function.	15	24.6
Recommendation (i.e. food, places)	18	29.5
Free Application	14	23
Compatible with any platforms.	3	4.9

The survey results as shown in Table 3 suggested a total number of 144 responses. The respondents are all Malaysian from different age range and majority of them are student who aged between 18-25 years old. There are 133 responses (92%) think that Malaysia's food should be introduced to the world. 62 reponsdents (43.4%) think that it is not easy to find Malaysia related food-finding applications in the market. In addition, there are 33 out of 144 repondents are not sure whether it is easy to find Malaysia related food-finding applications. There are 47.3% of the responses prefer to travel around East Asian region such as Korea, Japan, and Taiwan and so on. Besides that, there are more than half of the respondents or in an accurate 65.3% of them prefer travel in self-guided tour while only 12.5% of the respondents prefer to buy package tour. 69% of them like to search for local famous foods as the top activities during travel followed by visiting the famous places and sight-seeing. Next, based on the result polled from the question on the disadvantages of the current existing food-finding application, 62.3% of the responses show that the current existing food-finding application in the market are lack of information about the foods. In addition, there are 50.8% of the responses think that the current existing food-finding applications do not have user-friendly interface and 34.4% of responses think that the food-finding applications do not have unique function.

IV PROPOSED SOLUTION

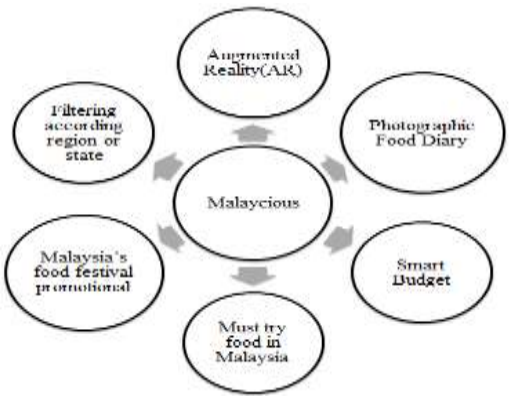

Figure 1. Malaycious Modules

Based on the result of the survey, it can be suggested that the food-finding application should utilize features to provide more information, more user friendly interface, and recommendation of food and places. *Malaycious* is introduced as a means of solution with android platform. Basically the main function of *Malaycious* is to be used as the food- finding application that utilizes augmented reality, Photographic Food Diary and Malaysia's Food festival promotional to provide more classified information to the users. *Malaycious* consist of six main modules (Figure 1), augmented reality (AR) for location, photographic food diary, Smart Budget, Top 10 Must Try food, Malaysia Food Festival promotion, and filtering according the region or state.

A. System design and Implementation

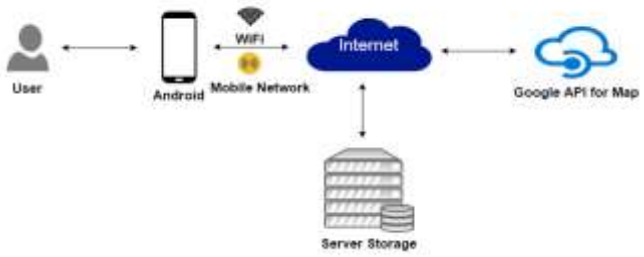

Figure 2. *Malaycious* Architecture Diagram

The Figure 2 shows the architecture diagram of *Malaycious*. The users access the application through their smartphones. Users are required to connect WiFi or mobile network in order to access the application. Once the smartphones are connected to the Internet, data is retrieved from the server storage. Users can send or request data from the server storage. For instance, user can add, edit, delete, and view by sending request to the server storage. The actions will be performed and stored into the server storage. Besides that, navigation information is retrieved from Google API. The data that retrieved from Google API is sent to the user's smart phone via the Internet. The data from the Google API is used to solve the Travelling Salesman Problem (TSP). The data such as distances and the duration required between two points are used in the Genetic Algorithm. Genetic algorithm uses the data from Google API to find the optimal path of the vertex.

B. Augmented Reality for Location

AR mobile platform is enhancing integration of virtual objects in outdoor environment (Mohamad El-Zayat 2011). The first function of this application is the augmented reality for location. This function displays the Point of Interest (POI) depend on the user's current position. The POI will be displayed on screen of the user's device. In short, the POI is drawn on the camera view of the device.

The augmented reality function starts with detecting the position of user. All the nearby restaurants that within the radius of 1km from the user's location are displayed in camera view. This feature allows user to efficiently obtain all the nearby restaurants based on user's current location. Users can click on the POI to get the details of the restaurant.

Figure 3. Augmented Reality Function in Prototype

C. Photographic Food Diary

Photographic food function capture and store the image that captured by the user. This function is similar to the diary but it only stored the pictures. For example, users can capture the food images; enter the details such as place, price and comments about the image. The images are displayed according to the date of user uploaded. This feature is to help user to record and capture the moments that they have experienced before. Besides that, users are able to nominate their pictures to the *Top 10 Must Try food*. The higher the average rating in the nominated food list, it then will be at the Top 10 list. Each of the users can only nominate the picture once. The average of the rating will be calculated according to the number of users. If the number of average rating in the nominated list is higher compared *Top 10 must try food* list, the nominated food will be ranked in the *Top 10 must try food* list. Equation (1) is an equation that calculates the average rating of the nominated food.

verage rating = Total Rating of Nominated Food / Total Numbers of Users. (1)

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Figure 4. Interface of the Nominated Foods

Figure 5. Details of the Nominated Food

D. Smart Budget

Smart budget is the function that helps user to filter the restaurants according to their preferences. It list out all the restaurants according to the preferences of users such as price, popular, halal, spicy preference, meals and cuisines. There is MapView function at the bottom of the filtered restaurants. This function will display the entire filtered restaurants in a map. The function of MapView has the same problem as Travelling Salesman Problem. Travelling Salesman problems (TSP) is a well-known NP-hard optimization problem, requires the determination of the shortest route passing through a set of cities under the condition that each city must visited exactly once (Yu Yang 2010). Yu Yang 2010 also stated that Genetic algorithm is one of the famous algorithms has always been used to solve the TSP. Thus, genetic algorithm is chosen in this proposed solution. Genetic algorithm is applied when the MapView button is clicked. Genetic algorithm is an algorithm that is used to find the optimal path between the points given. This algorithm will choose the optimal path by visiting the selected restaurants exactly once. This algorithm is able to find the fitness route among the selected restaurants.

Figure 6. List of restaurants

Figure 7. Restaurants on Map

E. Top 10 Local Food

This function is listed out the Top 10 Must Try Local Food in Malaysia. The top 10 Local Food will be ranked according to the average rating of the food. The higher the rating, it will be at the top of the list.

$$Average\ Rating = Total\ rating\ of\ the\ Local\ Food / Total\ Number\ of\ Users \quad (2)$$

Equation (2) is an equation that calculates the average rating of the ranking of the local food.

The food ranking will be displayed together with the image of the local food. User can click into the images to have further details of the food. In the details page of the Foods, user is able to check which restaurants have sold this kind of food. From there, user is able to get more detailed information such as name, description, address and contact.

Figure 8. List of Top 10 Local Food

Figure 9. Details of selected local food

F. Malaysia's Food Festival Promotional

Normally, user can only obtain the food festival information from the Television or Internet. Based on the investigation, most of the food-finding applications in Malaysia do not provide this functionality. Therefore, *Malaycious* provide the latest information of the food festivals that currently held in Malaysia. In this feature, users are able to add the food festival event that they wish to the calendar of the phone. The date is set at the calendar of the phone. When the date of the festival is reached, push notification is popped up to notify users. With this feature, users are able to obtain the latest food festival information.

Figure 10. Food Festivals in Penang

Figure 11. Details of Food Festivals in Penang

G. Filtering According Region or State

This feature allows user to filter the food according to the region or state. This purpose of this feature is to filter or providing specific information to the users rather than generic one. By clicking the markers in the map, the food of the selected state is filtered.

Figure 12. Welcome page of the application.

Figure 13. Regions or state in Malaysia

V DISCUSSION

The preliminary study which utilizes the survey of 144 participants has been conducted to investigate the current issues of the existing food application in the current market. One of the issues has been highlighted was the ease to use factor and lack of useful information. *Malaycious* will counterbalance the problems. *Malaycious* is developed as a mean to improve the existing food-finding application. The user of *Malaycious* is expected to be locals and the tourist of Malaysia. By using such application, it will help them to gain more information, help in navigation, and obtain more classified and suggestive information in augmented reality. Genetic algorithm is modified and implemented to solve the Travelling Salesman Problem. This algorithm enhances the work of finding the optimal path of the restaurants.

VI CONCLUSION AND FUTURE WORKS

In conclusion, the existing food-finding application in the market can be significantly improved. Since the existing food-finding application do not contain much features (i.e Augmented Reality, Photographic Food Diary, Smart Budget etc). It can be viewed the current results of this development is pretty convincing. *Malaycious* is in the final phase of development where it needs to be evaluated and validated. The limitations of this application are related on the issues of online or offline of data (i.e. must have Internet connection). In addition, results of the evaluation have not been discussed (i.e. still ongoing). *Malaycious* has a great potential to be used as intelligent tool to promote Malaysia Tourism.

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